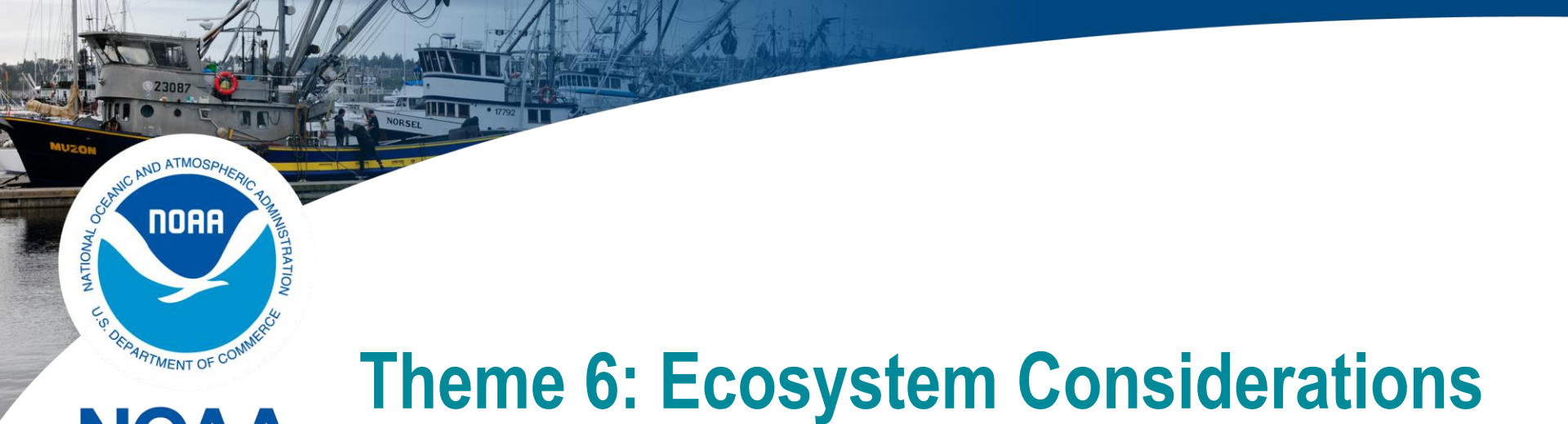


NOAA FISHERIES

Southeast Fisheries Science Center

Theme 6: Ecosystem Considerations and Next Generation Assessments

July 2014

Theme 6

Ecosystem considerations and next-generation assessments

- How important are ecosystem considerations and next-generation assessments for improving the science used in management of managed fishery species in the southeastern United States?

Questions that could be considered

- What are the short and long term expectations of SEFSC clients (councils, marine fishery commissions, stakeholders) with respect to ecosystem management goals and objectives?
- How can the SEFSC evolve to ecosystem based approaches to fisheries management with very limited growth in base funding?
- What efficiencies can the Integrated Ecosystem Approach offer for assessment and management of single species?

Discussion Outline

1. **Introduction to the GOM IEA**
2. General approaches to merging ecosystem information into stock assessments
3. GOM Ecosystem Status Report
4. Swordfish in the North Atlantic and AMO
5. CMS Model approaches
6. Red Tide as an indicator for gag natural mortality
7. The GOM Three Year Plan

Large ambitious goals usually require that people work together

NOAA NATIONAL COASTAL DATA DEVELOPMENT CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Sea Grant Florida

national ocean service

Innovate, Incubate, Integrate
noaa research
NOAA's OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH

Coastal Services Center

GULF OF MEXICO Fishery Management Council

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

GULF OF MEXICO ALLIANCE
Texas Louisiana Mississippi Alabama Florida

USF UNIVERSITY OF SOUTH FLORIDA

MARES
Marine and Estuarine Goal Setting for South Florida

UF UNIVERSITY of FLORIDA

GULF OF MEXICO LME

NGI
NORTHERN GULF INSTITUTE

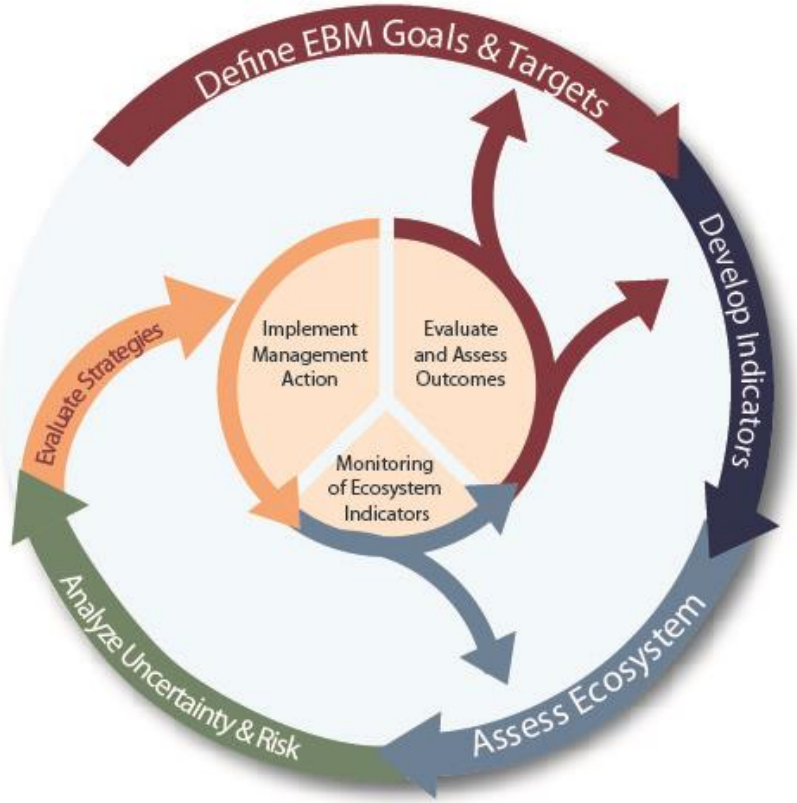
TEXAS A&M UNIVERSITY CORPUS CHRISTI
THE ISLAND UNIVERSITY

ROSENSTIEL SCHOOL OF MARINE & ATMOSPHERIC SCIENCE
CIMAS
COOPERATIVE INSTITUTE FOR MARINE AND ATMOSPHERIC STUDIES

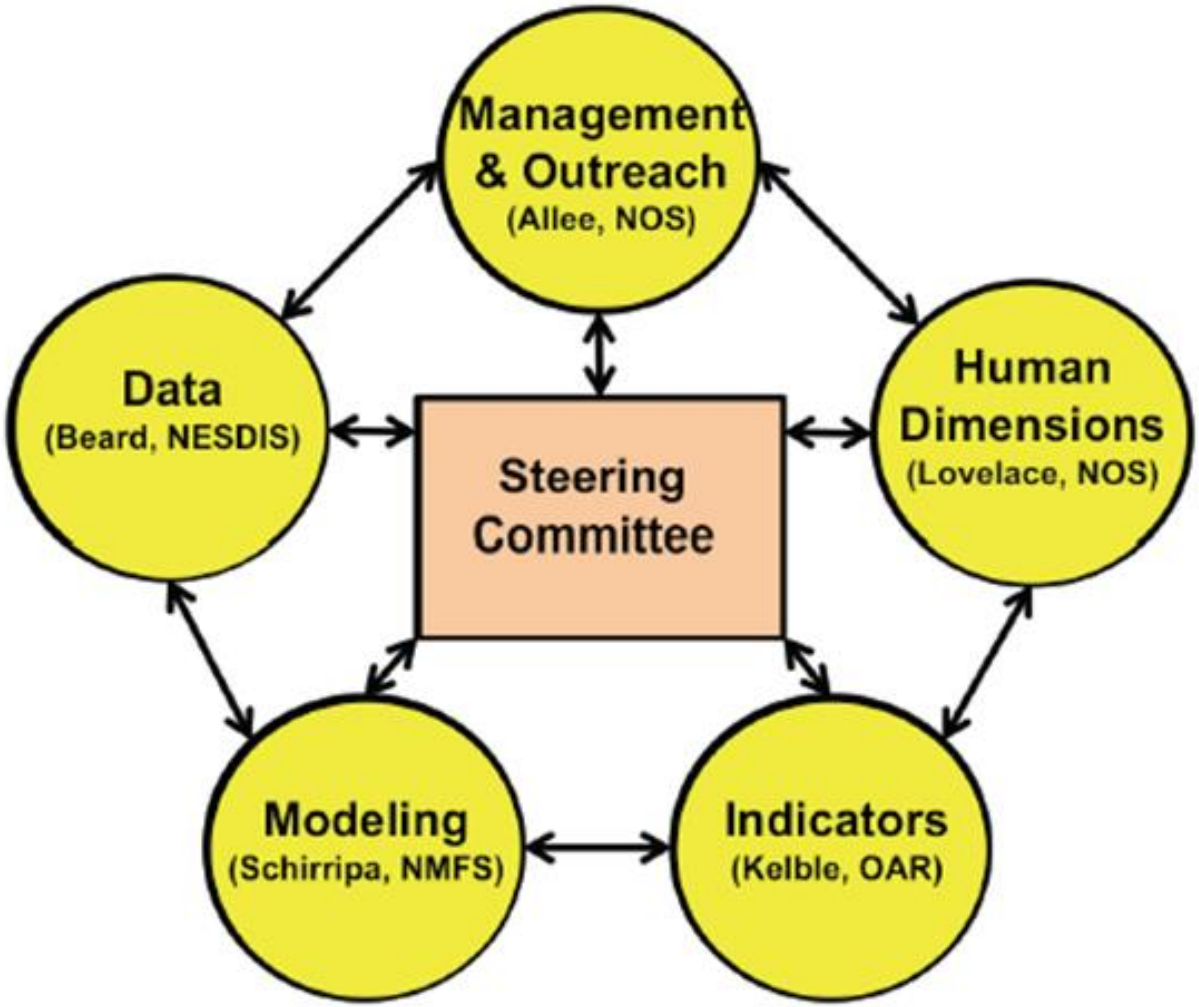
What is an IEA?

A structure to assess ecosystem status relative to objectives and evaluate the holistic impact of potential management actions, thus

- A decision-support process that synthesizes and analyzes diverse data and ecosystem model outputs
- It is modular, iterative, scaleable, and adaptable
- It shares a common national framework, yet with regional variation in implementation
- It provides assessments of the ecosystem across and within multiple ocean-use sectors



GOM IEA Organizational Chart Across NOAA Offices



What Have We Developed Relevant to GMFMC?

- Ecosystem Indicators
  - Compiled into the first GoM Ecosystem Status Report
- Ecosystem Indices that can be used in Stock Assessments
  - Recruitment, red tide (mortality), etc.
- Ecosystem Risk Analysis (*optimum yield*)
- Suite of Ecosystem Models

Prior SSC recommendation (March 2013)

- **The Standing and Ecosystem SSCs recommend that the Gulf of Mexico IEA Program, state, and academic partners continue working with the Gulf Standing and Ecosystem SSCs to expand the integration of ecosystem components into the assessment and management of fishery resources in the Gulf of Mexico.**

- **The Standing and Ecosystem SSCs recommend that the Gulf of Mexico IEA Program, state, and academic partners work in collaboration with the SEDAR Steering Committee, and data and assessment working groups, to develop products that integrate ecosystem analyses into the SEDAR stock assessments.**

Changes to the MSA may require Councils to…

Develop fishery ecosystem plans that:

- Describe ecosystem conservation goals and objectives for multiple fisheries
- Include ecosystem-level optimum yield that takes into consideration ecosystem
- Identify indicators to measure the achievement of ecosystem conservation goals

Strengths & Challenges

Strengths

1. We are drawing on the individual strengths across NOAA's line offices and scientific disciplines
2. We have a wealth of existing components from which to start to build our first IEA

Challenges

1. Resources invested in the IEA effort must be borrowed from other duties
2. Unlike our FM Councils, there is no one directed management entity that is responsible for all of the ecosystem services under consideration

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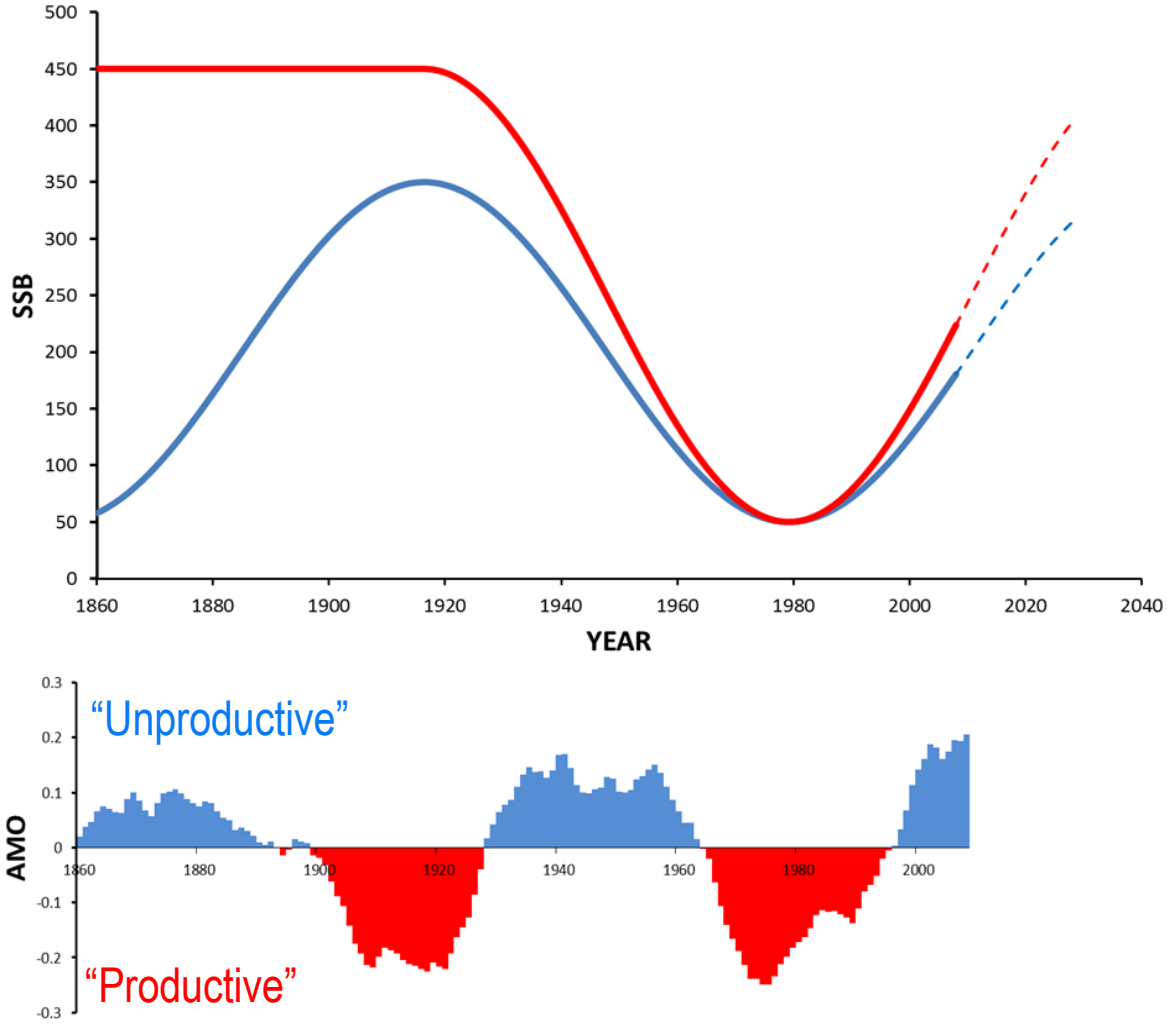
Uses of Ecosystem Information

- Refine our historic view of the nature of the ecosystem and thus identify more realistic baselines (e.g. Virgin Biomass and Recruitment)

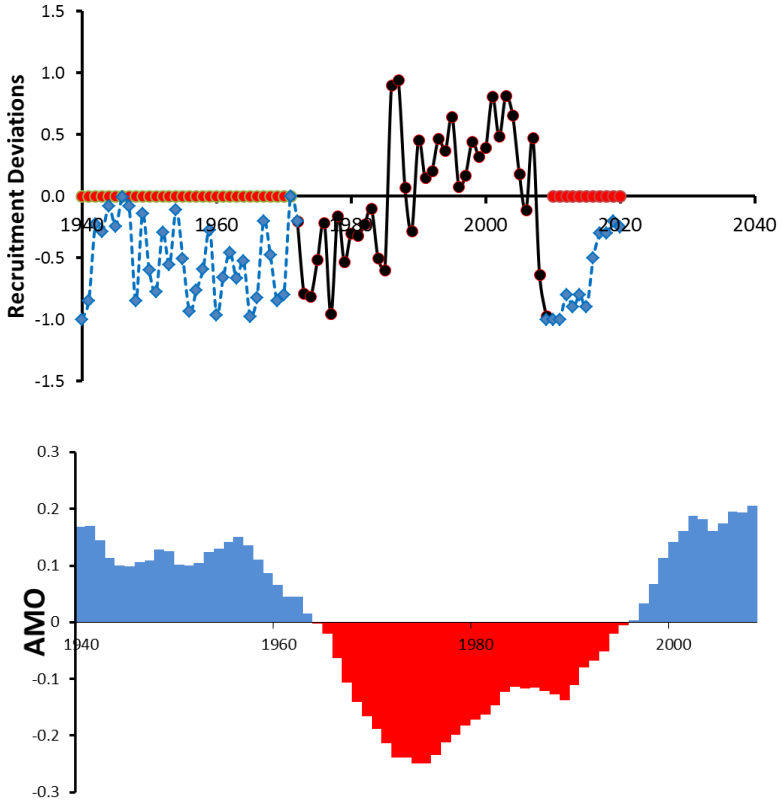
- To provide the stock assessment with near real time information of the most recent years and events that are known to affect recruitment and/or survival

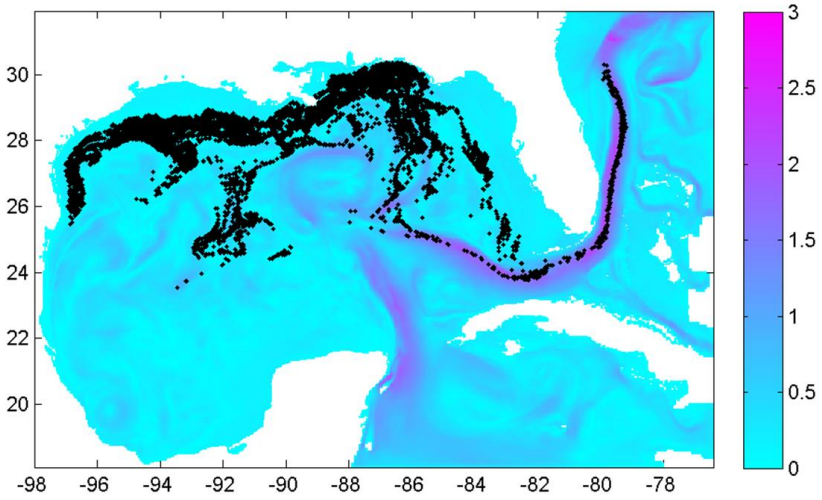
- To provide decision support to managers to better choose between a range of forecast harvest options

More Realistic Baselines



Historic and Most Recent Recruitments





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NOAA
FISHERIES
SERVICE

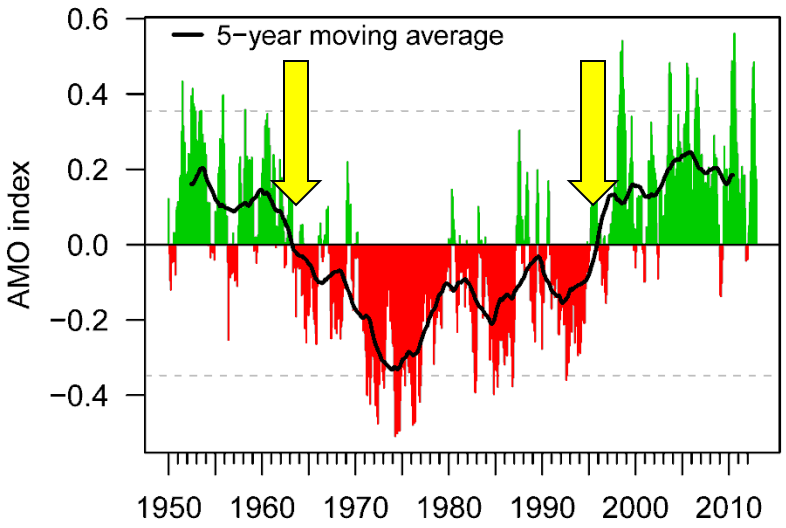
Evidence of climate-driven ecosystem reorganization in the Gulf of Mexico

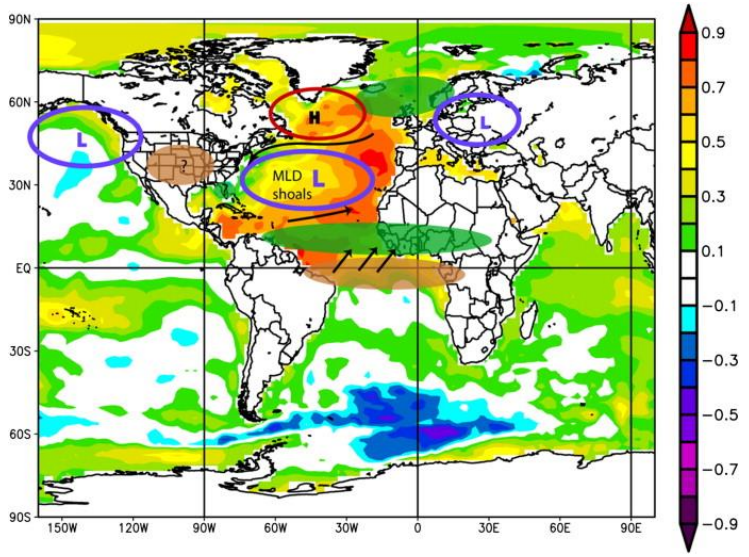
NOAA Southeast Integrated Ecosystem Assessment Team

Manuscript in preparation

NOAA FISHERIES SERVICE

Atlantic Multidecadal Oscillation?





Nye et al. 2013

AMO warm phase:

- Increased SST in GoM
- Decreased precipitation in U.S.
- Shallower mixed layer in GoM

Expect to see an ecosystem shift in ~1965?

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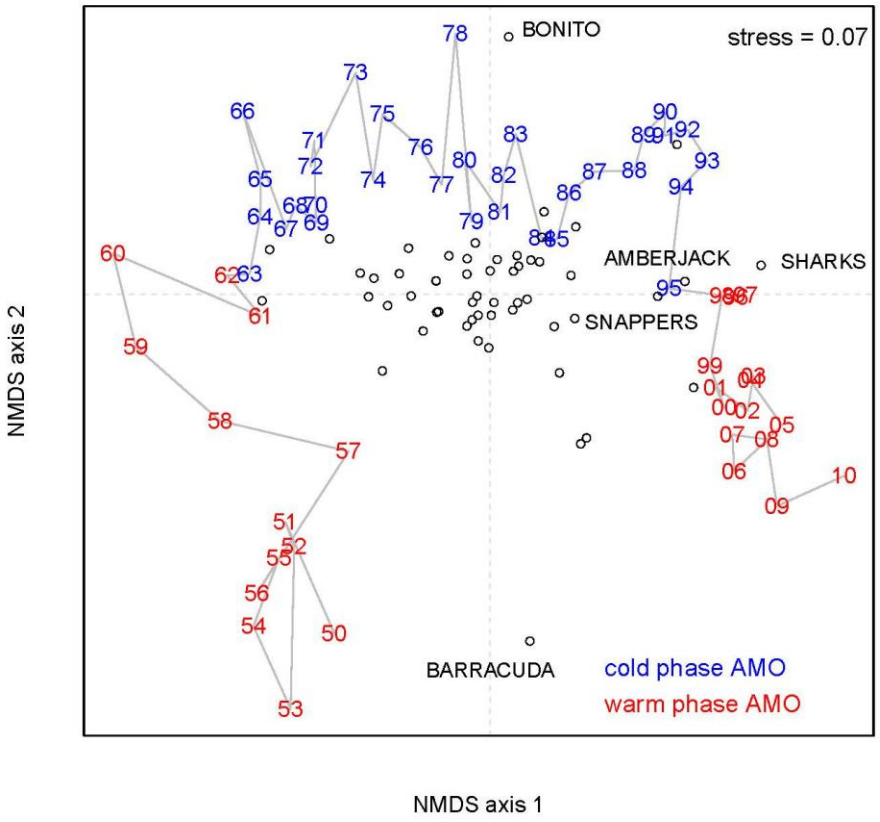
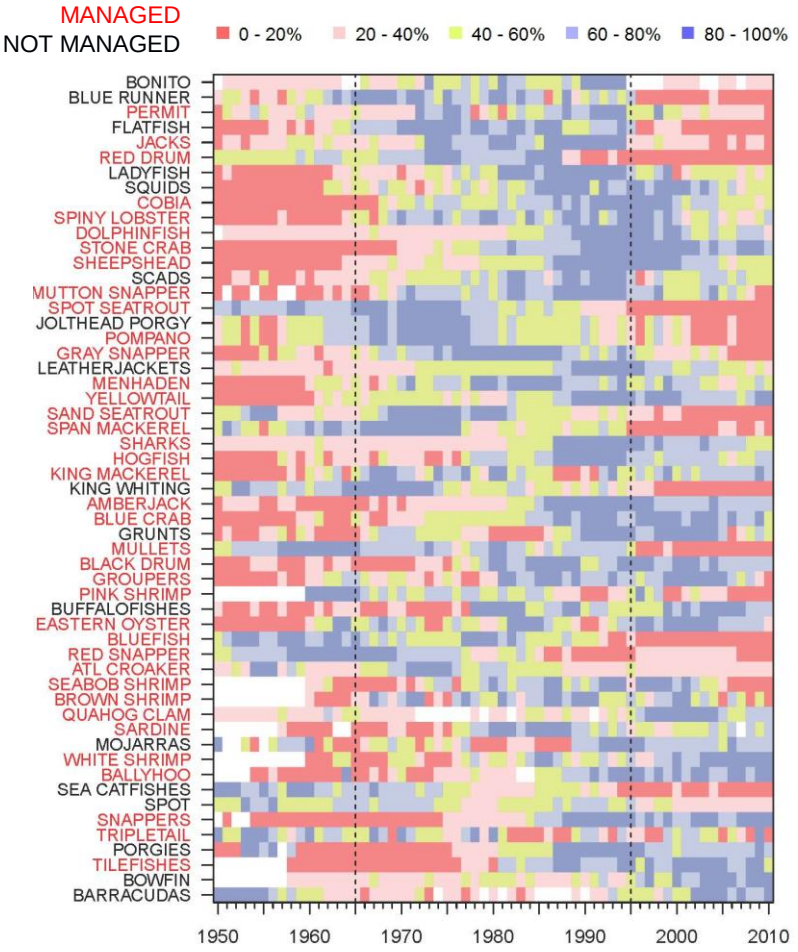
NMDS of landings data to 1950





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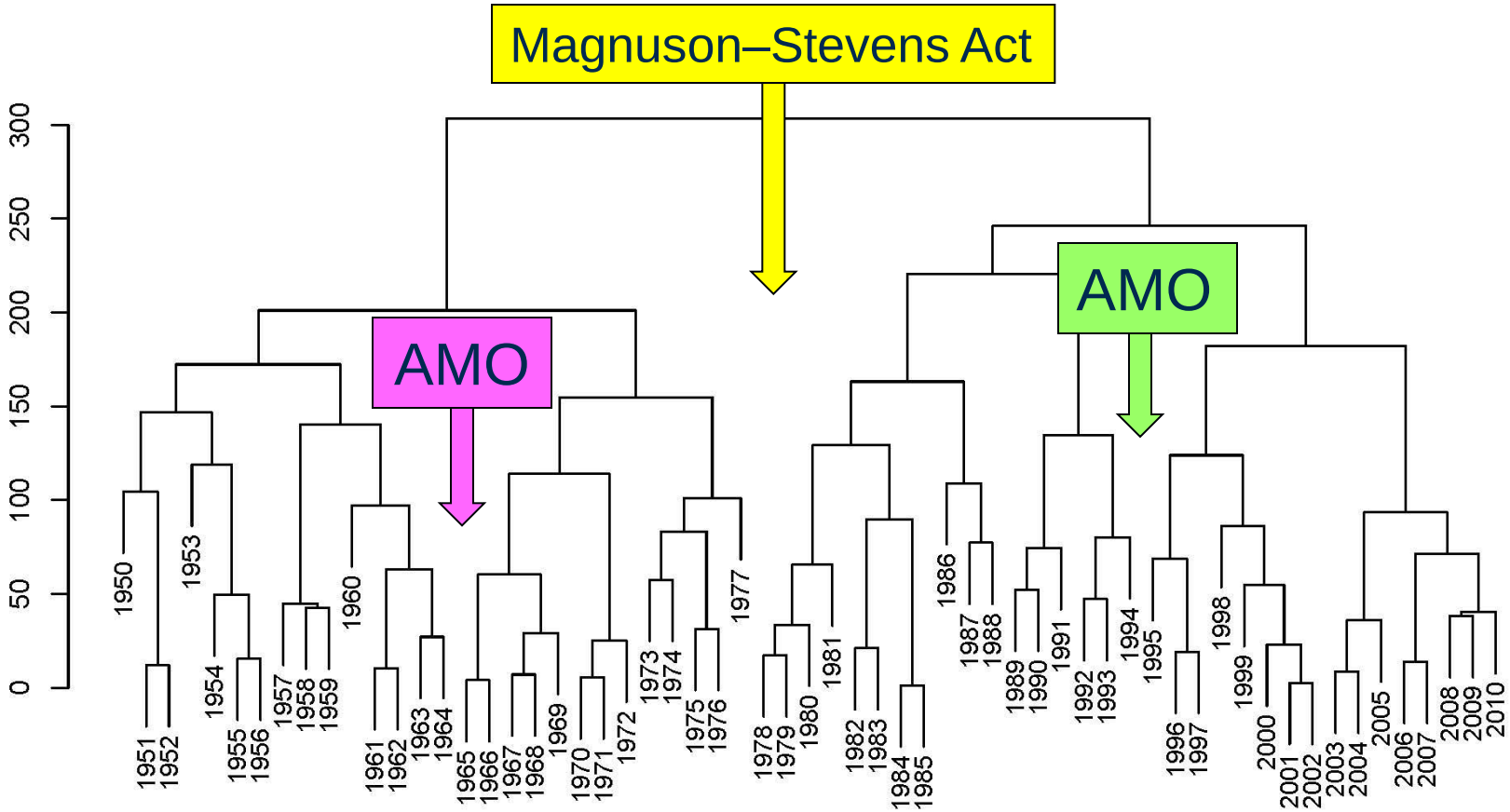
Chronological clustering of landings



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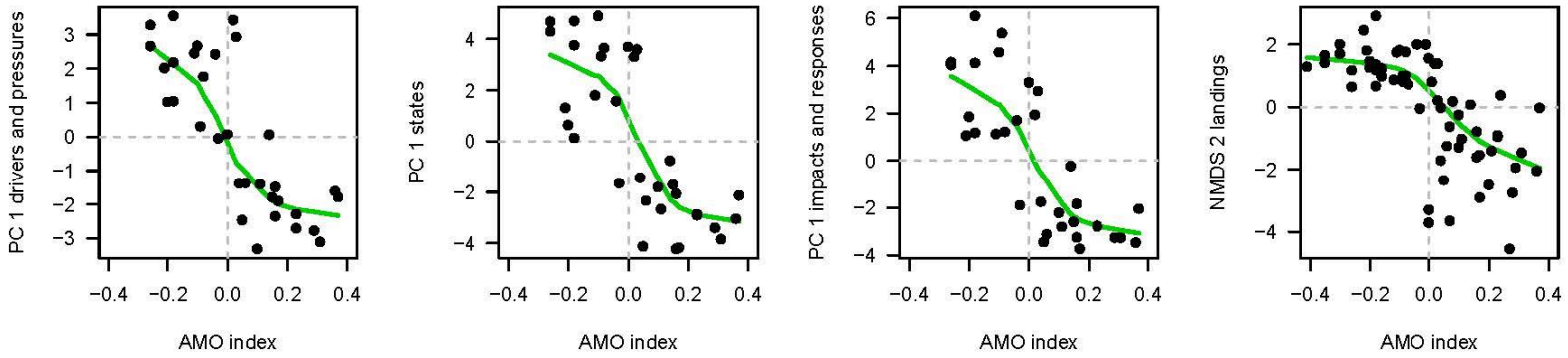
Conclusions



- Different ecosystem states appear to be associated with warm and cool phases of the Atlantic Multidecadal Oscillation
- Changes in GoM likely due to both climatic and anthropogenic forces – and the interactions between the two

Strengths & Challenges

STRENGTHS

1. The Ecosystem Status Report has proven to be a useful tool for communicating the GOM Ecosystem to both assessment biologist as well as the GMFMC
2. It gives us a means to see the GoM ecosystem as a whole and give us indicators to associate with Goals and Objectives

CHALLENGES

1. Historic data are lacking
2. Periodic updates will require resources

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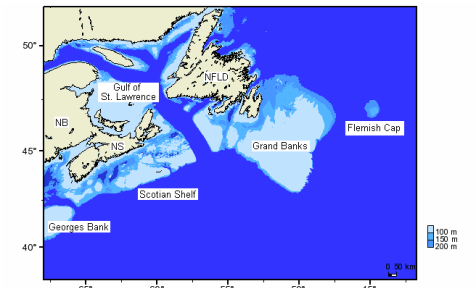
A HYPOTHESIS OF A RECENT REDISTRIBUTION

OF NORTH ATLANTIC SWORDFISH



SCRS/2013/1

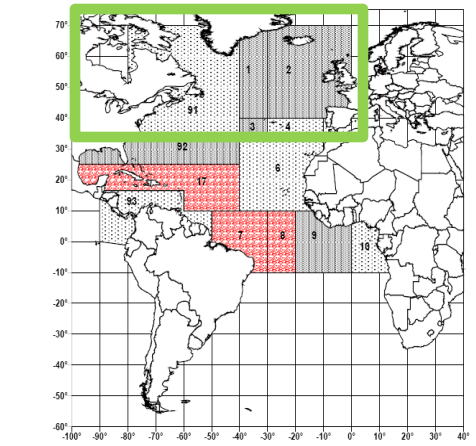
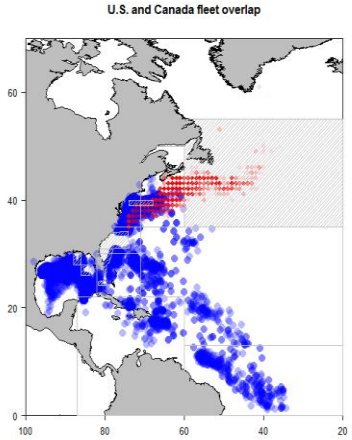
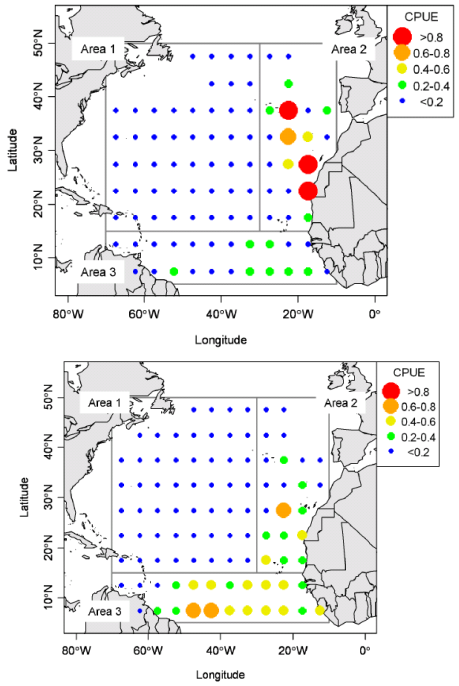
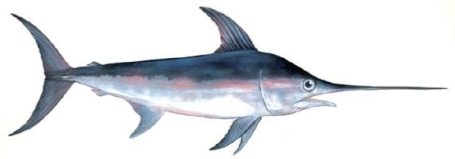


Fig. 1. The area stratification used in the CPUE analysis. The data only in the north of 5N are used in the study (co



(b) 1995-2011





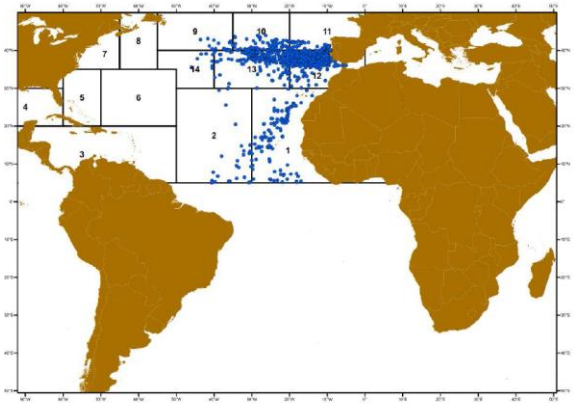
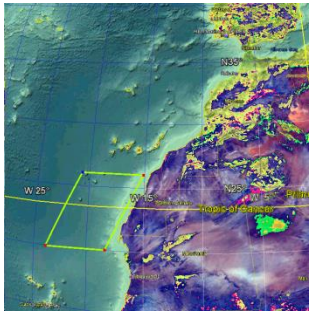


Figure 1. Map with the definition of the fishing areas in the North Atlantic used in this study. Due to small sample sizes, the areas 1+2, 9+10 and 13+14 were joined for the analysis and models.



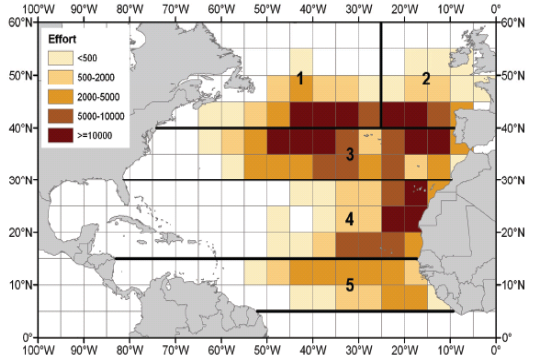
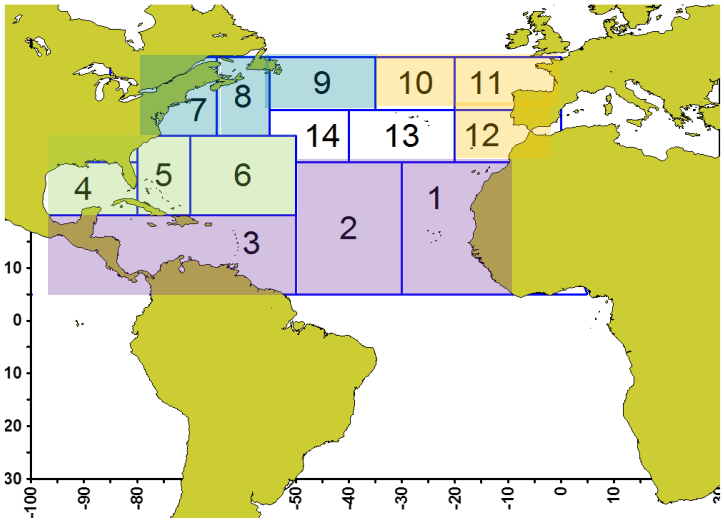
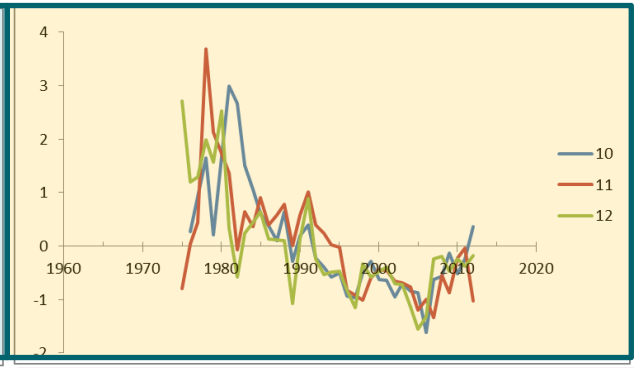


Figure 1. Geographical distribution of the nominal fishing effort (in thousands of hooks) used for the CPUE standardization of the Spanish surface longline fleet in the North Atlantic, during the period 1986-2011 and area definition used for the GLM runs.

Lsmeans of year*area
From GLM (Ortiz et al. 2013)

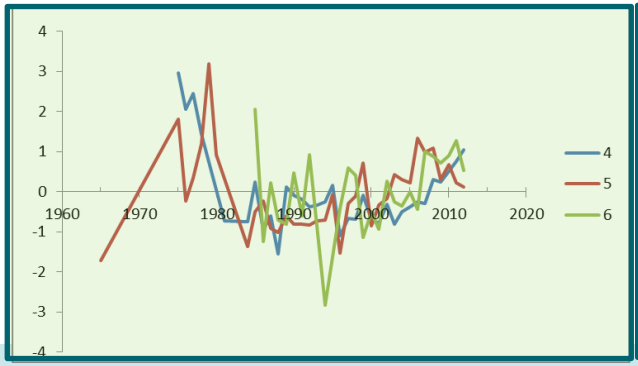


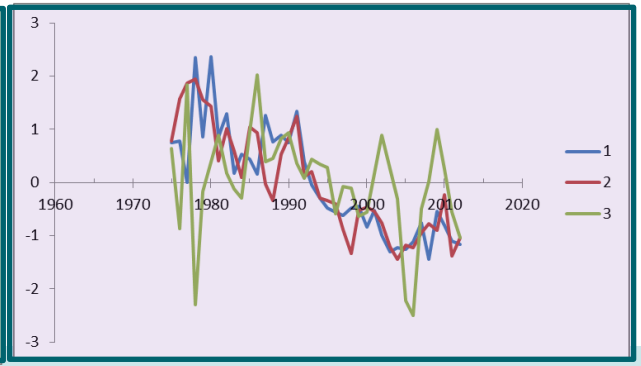
Northwest



Northeast

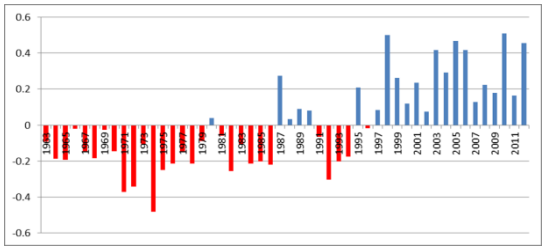
Middle



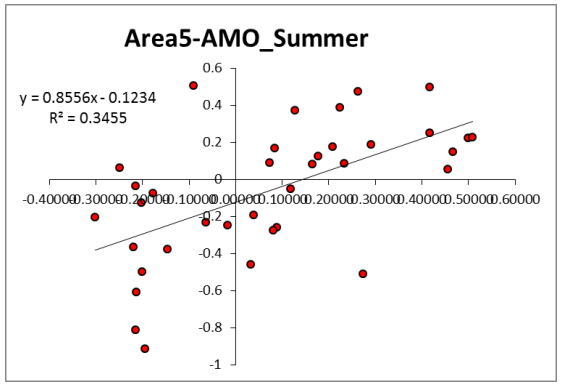


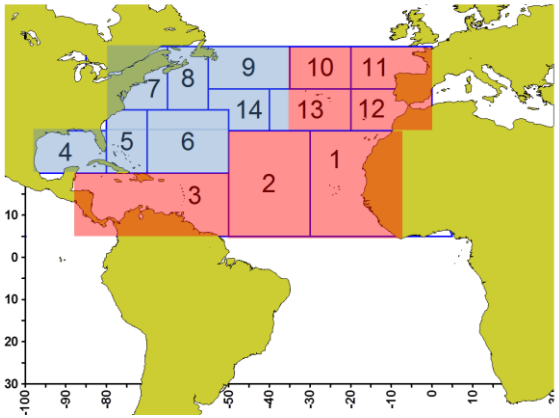
Southeast/west

Changes in Catchability with the AMO

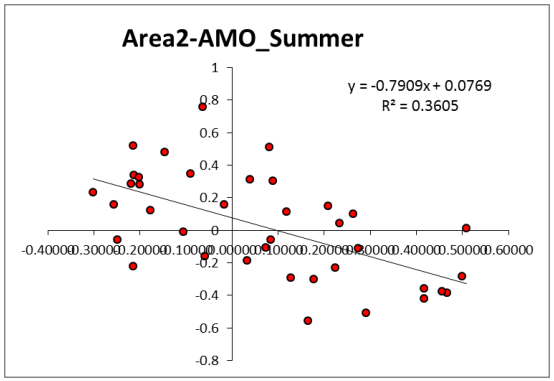


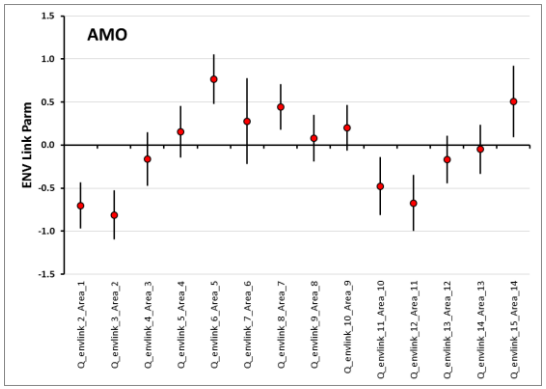
AMO vs. CPUE residuals West



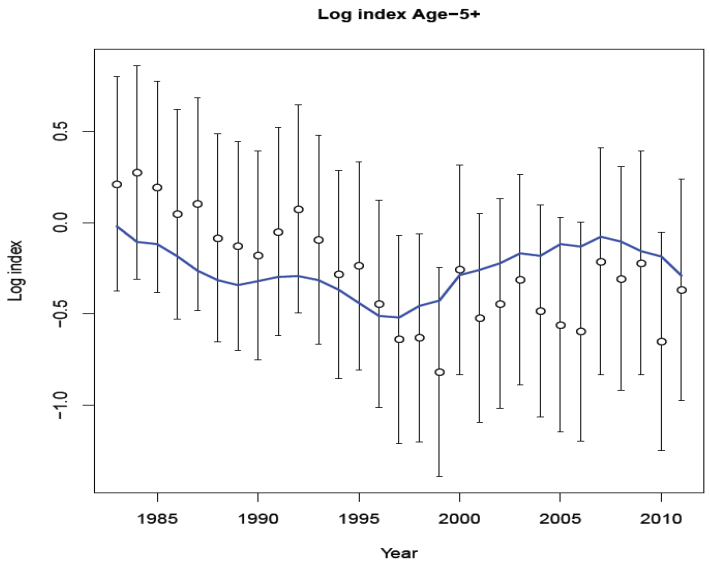


AMO vs. CPUE residuals East

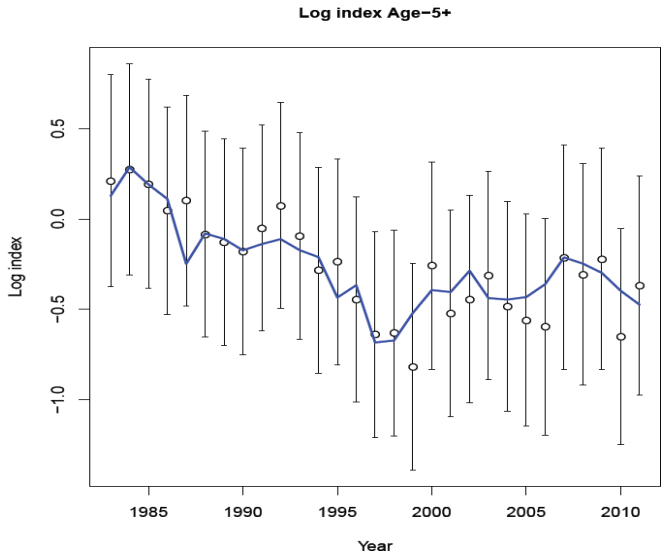


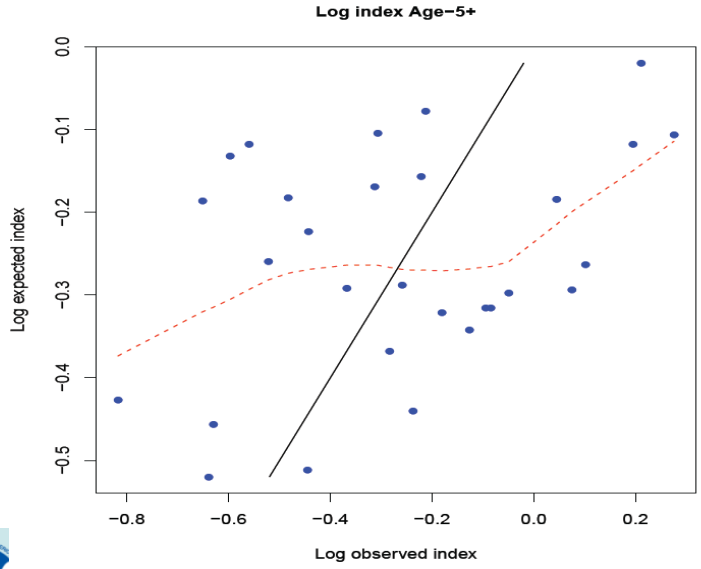


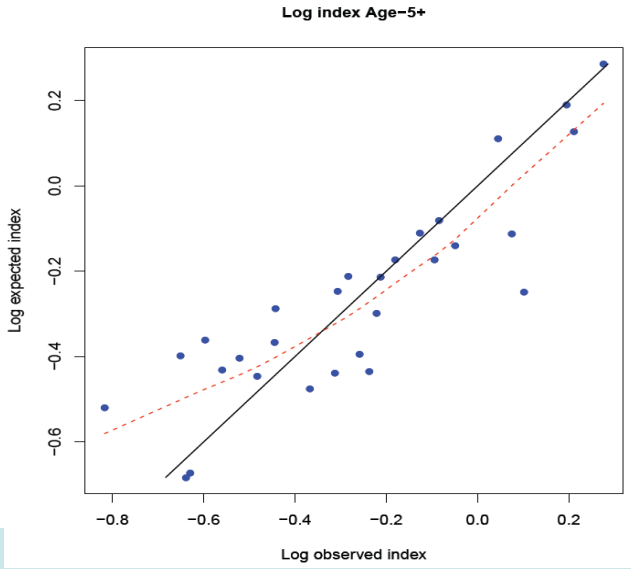
Run_5_ENV_v1



Run_5_ENV_v2







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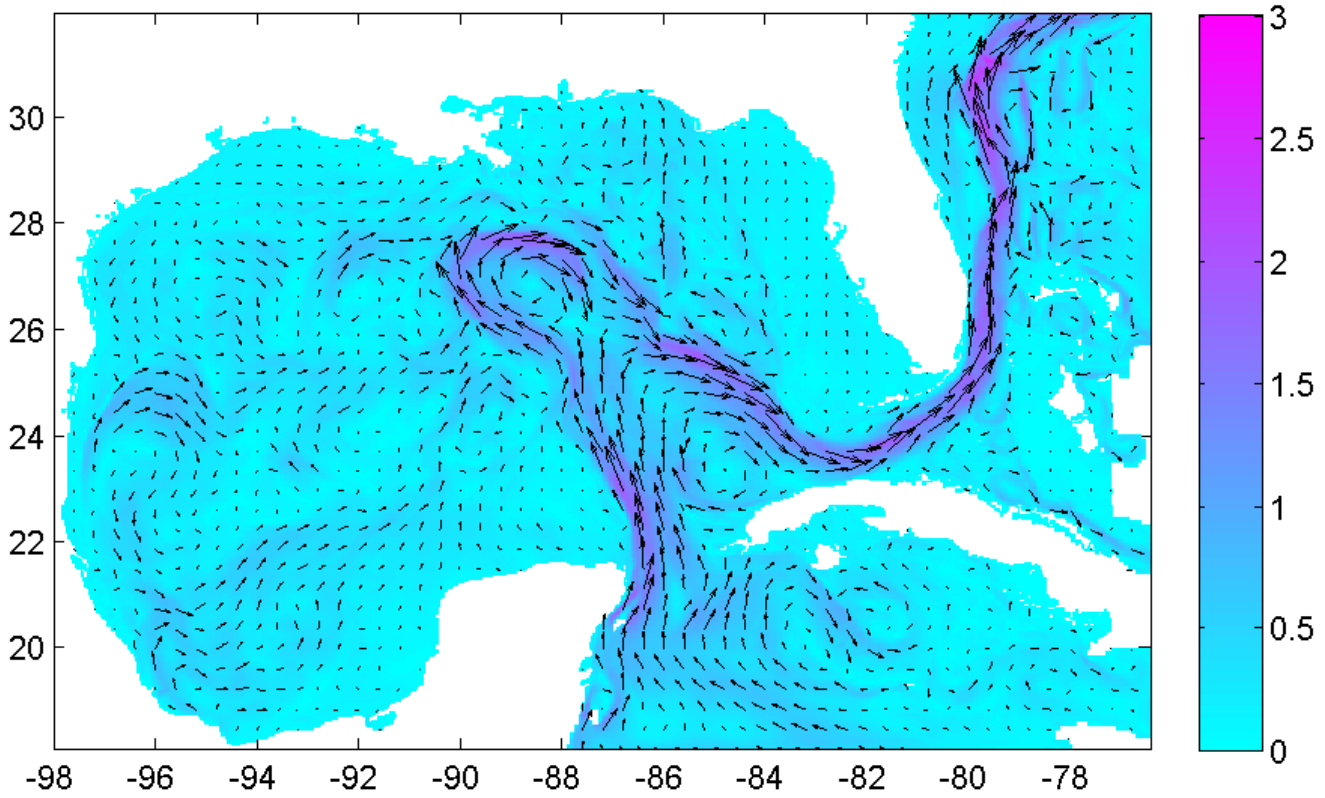
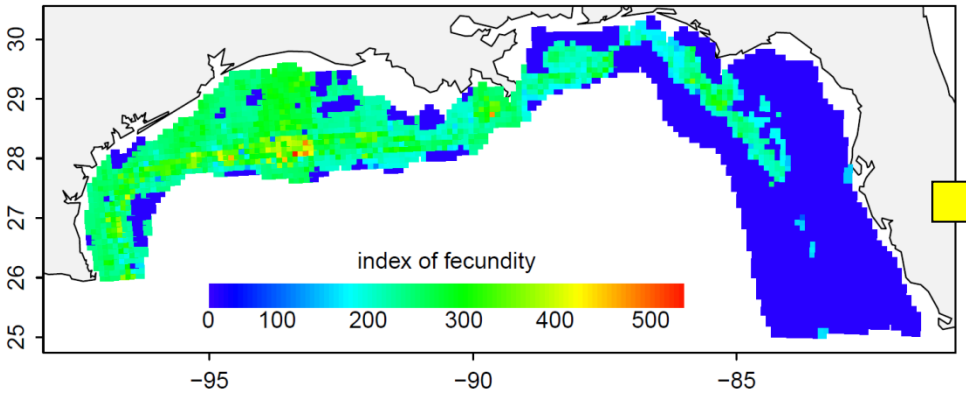
We know where the currents are…

(www.hycom.org)

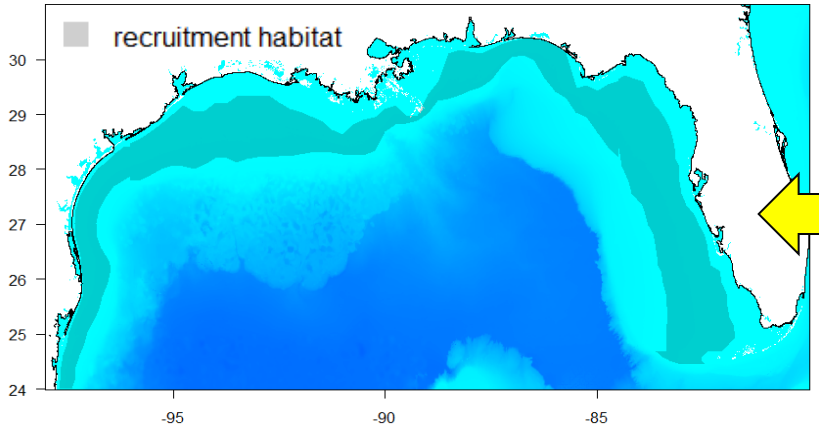
- Data-assimilative hydrodynamic model (HYCOM)

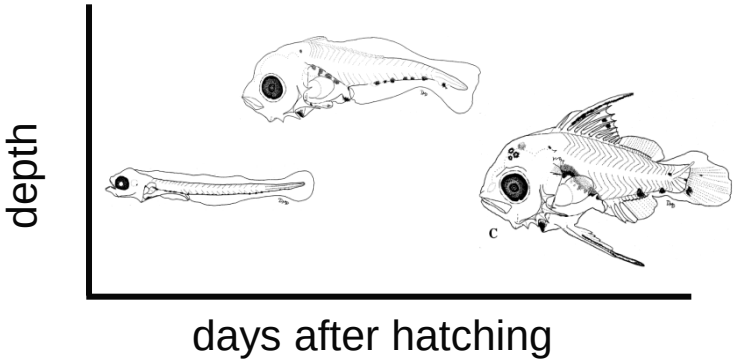


…and we know where the eggs are released and where the larvae settle…



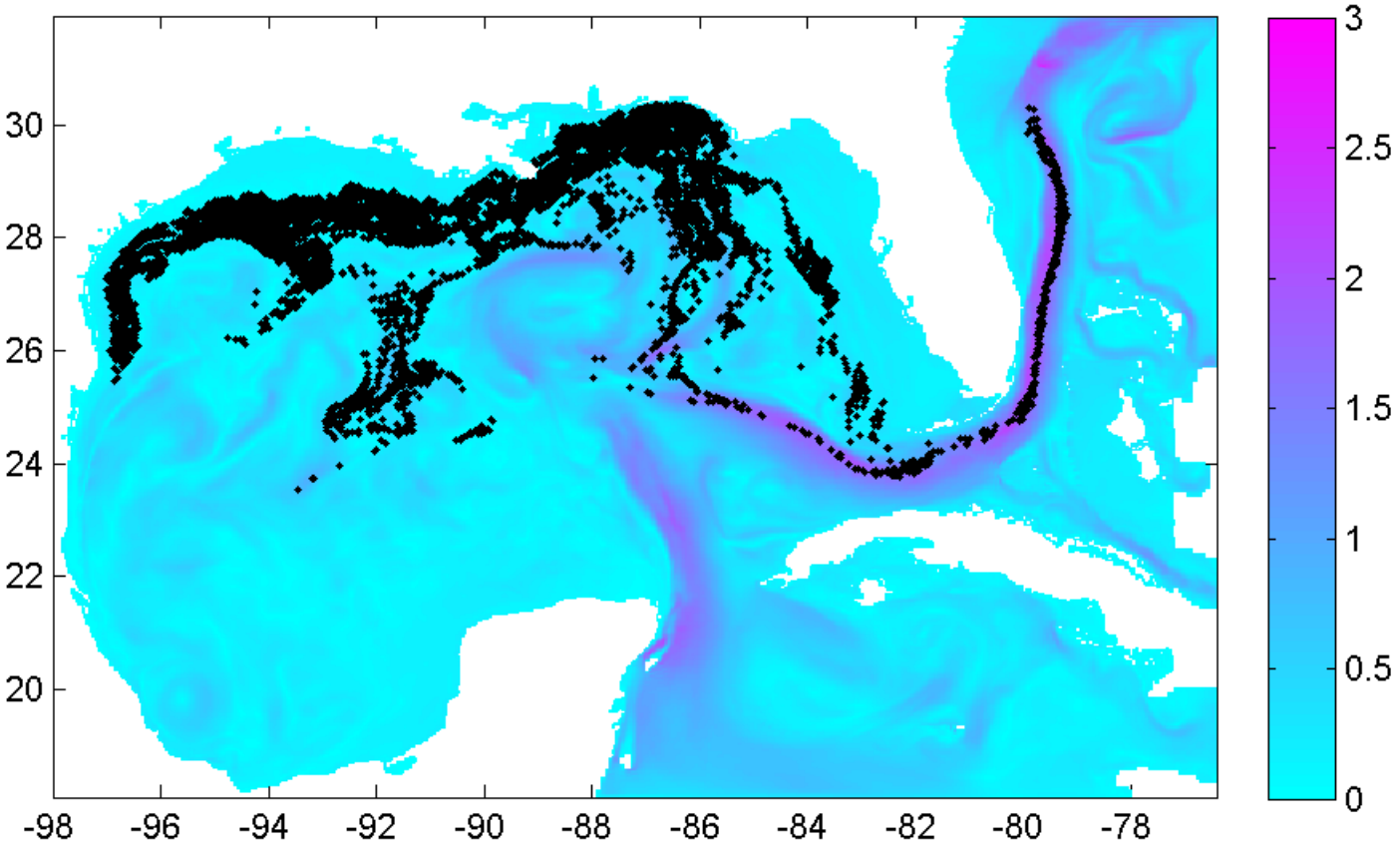
Spawning time:
May 1 – Oct 31
Spawning frequency:
every 5 days
Pelagic larval duration:
26 – 30 d





…so we can model recruitment events!

Paris et al. (2013) EM&S



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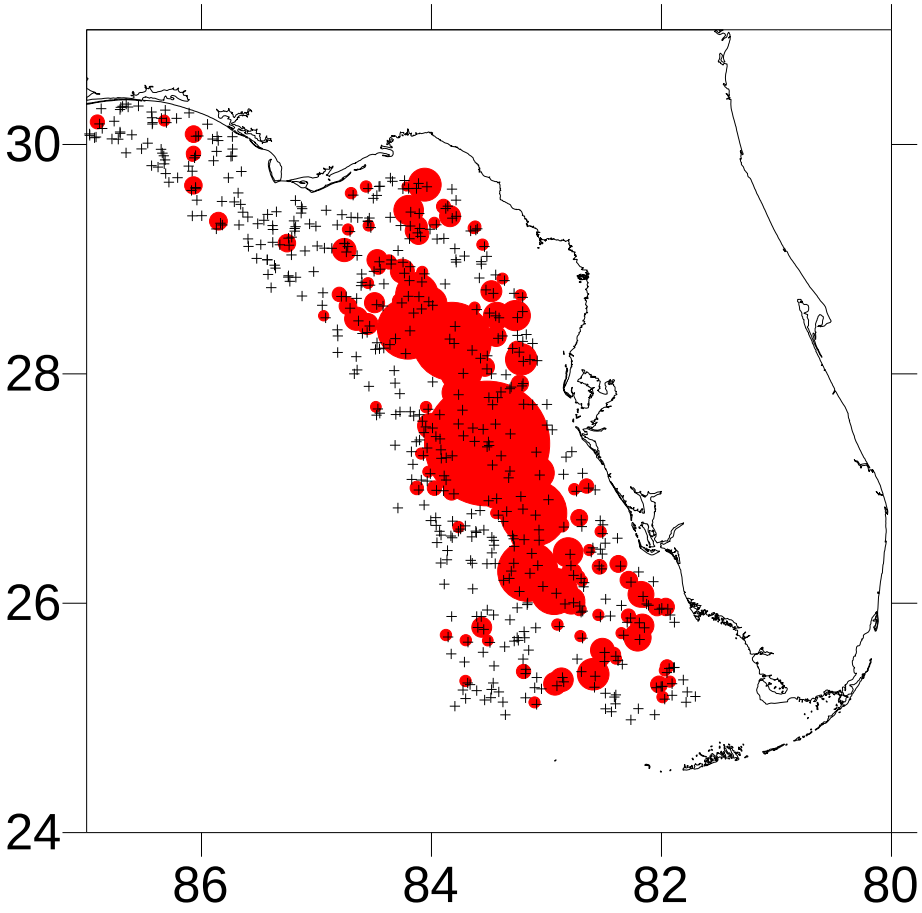
Red tides (*Karenia brevis)* in Gulf of Mexico

- Dinoflagellate*, Karenia brevis*
- brevetoxin paralyzes, suffocates fish and mammals; bioaccumulates by ingestion
- First recorded by Hernan De Soto 1500's
- 1946–47 bloom estimated kill of 500 million fish.
- Human health concern
  - shellfish and beach closures
  - Large research initiatives (EcoHab, FWRI, etc.)

http://www.whoi.edu/science/B/redtide/rtphotos/rtphotos.html

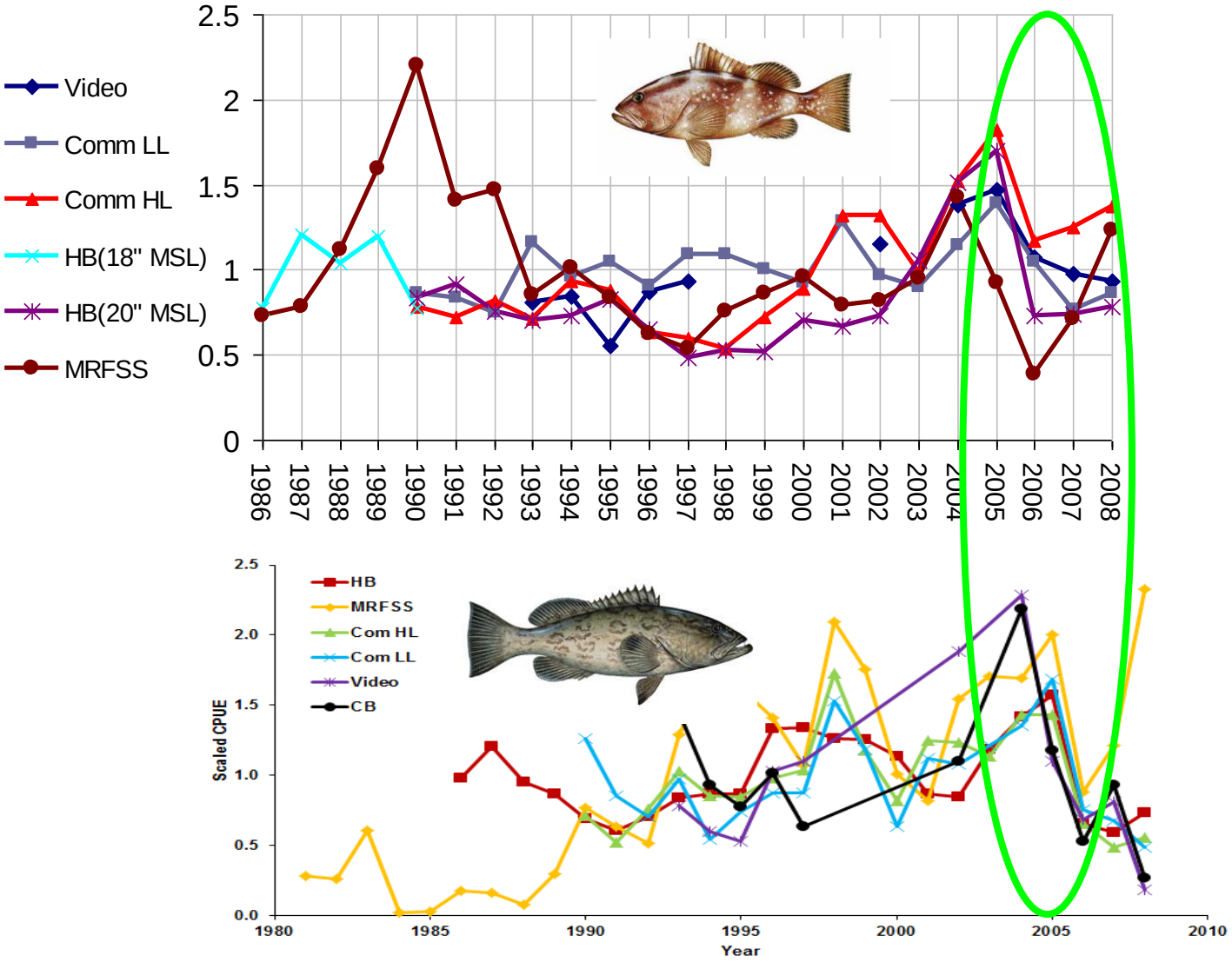
Red tide overlaps the core grouper distribution, particularly the inshore regions



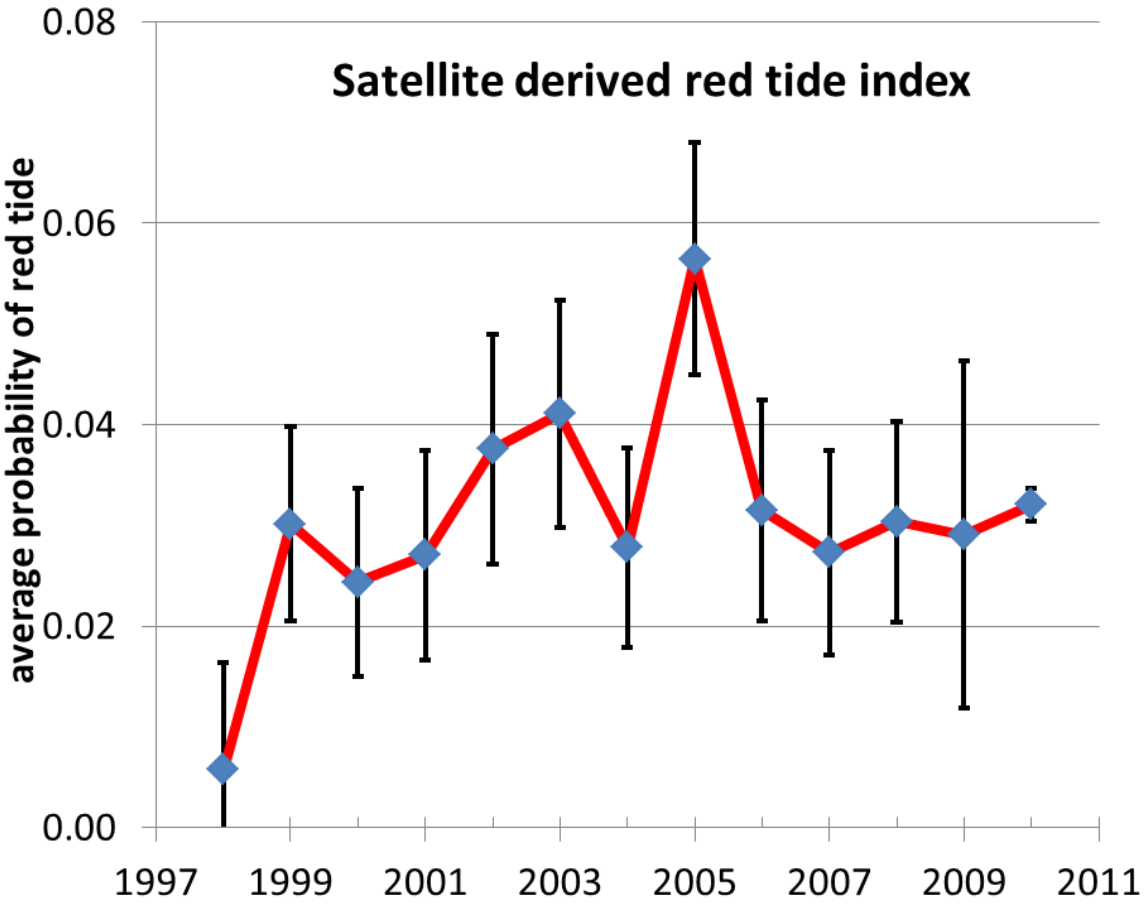
NMFS longline survey stations

FWRI red tide Data

2005-06 Red and Gag Grouper indices ~ 50% decline



Including the index greatly improves population modeling and explains what was otherwise unexplained declines (~20% of the population, or 8 million groupers (gag and red combined) in 2005



7/2/2014

Walter et al 2013

Strengths & Challenges

Strengths

1. We are making solid steps in Next Generation assessments
2. We believe we are improving our assessments and our relations with stake holders as we broaden our view of the ecosystem

Challenges

1. Resources invested in the NG assessments must be borrowed from other duties
2. We don't want to give the impression that we will ALWAYS make an improvement an assessment via ecosystem considerations (i.e. set ourselves up for failure).

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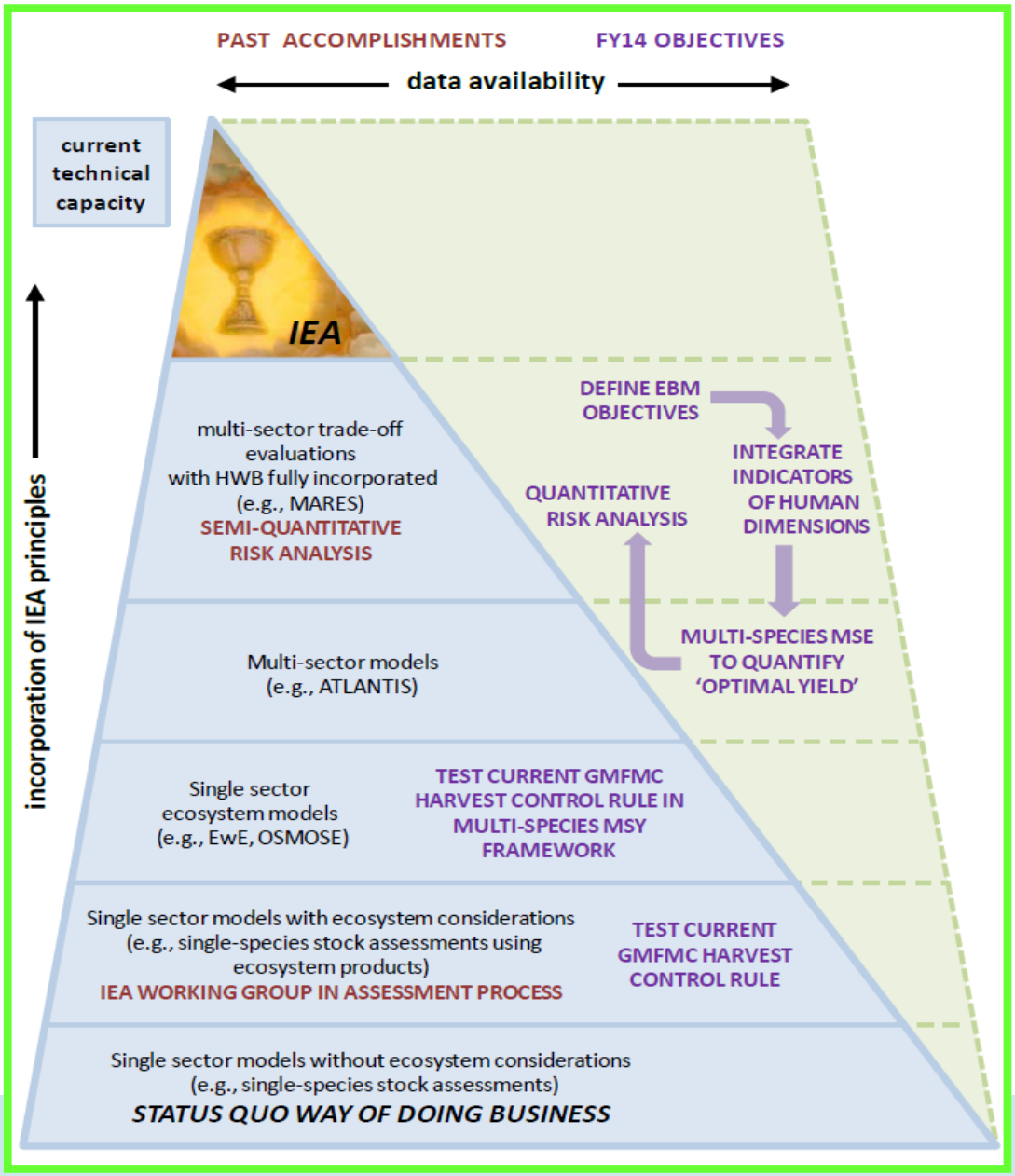
The GOM IEA 3 Year Plan (FY14-16)



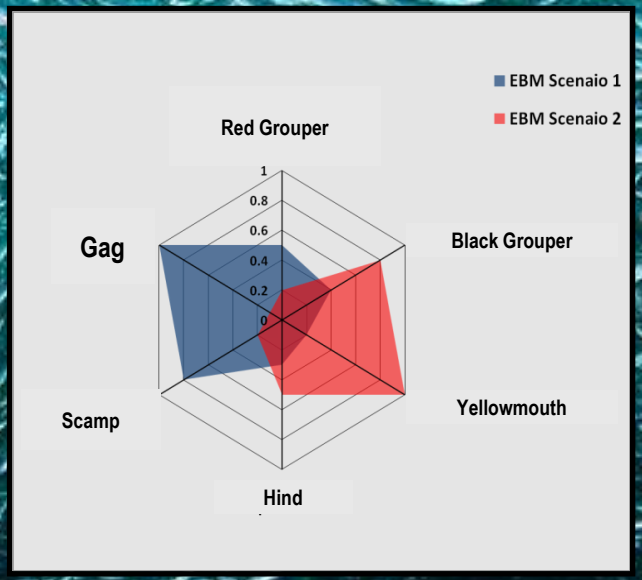
Tier I Ecosystem Products

- ✓ Tier I products are designed specifically to support single-species assessment effort by bringing in ecosystem considerations

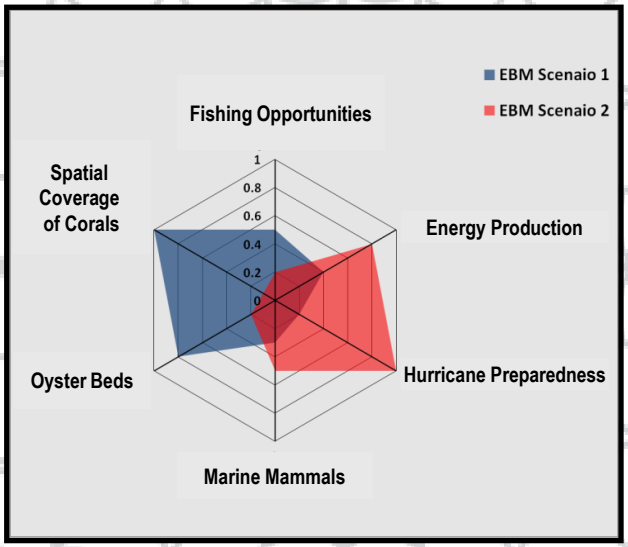
Harvest Control Rule based on Single Species, Equilibrium Considerations

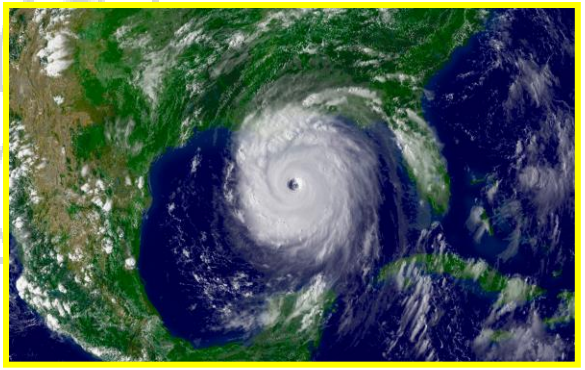
- ✓ Use MSE to ask if the current Harvest Control Rule (*P**) is robust to more frequent/intense episodic events that can effect natural mortality (i.e. red tide, oil spills, etc.)

Tier II - GOM Shallow Water Grouper Complex



Tier III - Management Strategy Evaluation involves assessing the consequences of a range of management options and making obvious the trade-offs in performance across a range of management objectives.





GMFMC Meeting Motions
Key West, Florida, June 26, 2014

- To request that the Council ask the Ecosystem SSC, in cooperation with the Standing SSC, to develop a set of suggested goals and objectives of an Ecosystem-Based Fisheries Management plan that considers possible measurable targets. [unanimous approval]

- That the Council convene a working group comprised of some members from the Ecosystem SSC, Standing SSC, Socioeconomic SSC of the Council to develop approaches for identifying and prioritizing ecosystem and socioeconomic information needs for the fisheries managed by the Council. [unanimous approval]

- That the GOM IEA Program work with the Gulf Standing and Ecosystem SSCs to evaluate the current red grouper Harvest Control Rule to determine if it is robust to possible future changes in intensity and frequency of episodic events of non-fishing mortality. [Approved, but ~2 against]

Leveraged Funding

1. IEA Funding
   - Pays for OSMOSE model via **RSMAS post-doc** (wrt SEFSC)
2. NOAA Fisheries And The Environment
   - Ecosystem Status Report, CMS modeling, **FATE FTE**
3. ITQ Funding
   - Funded the gag grouper/ red tide work via **RSMAS post-doc**
4. Florida Sea Grant
   - Funding the Atlantis and EwE modeling effort via **USF Ph.D. students**
5. New Marine Fisheries Initiative (MARFIN) RFP Priority
   - Integrated Ecosystem Assessments: modeling, diet, socioeconomics, data resurrection, identification of drivers and pressures, **TAMU students**

Alternative Ways Forward

How can the SEFSC evolve to ecosystem based approaches to fisheries management with very limited growth in base funding?

1. Create a new Ecosystem Division/Branch through the accrual of new resources
2. Create a new Ecosystem Division/Branch via reorganization of existing resources
3. Evolve the current structure into a new way of doing business by creating an Ecosystem Team via an informal partitioning. This informal partition would consistent of firm participation of member(s) from each Division that would be directed by a Chair (i.e. no formal supervision). Analogy of a baseball team.
4. Hope that Restoration funding will support a new Division or above mentioned Team

Theme 6

Ecosystem considerations and next-generation assessments

- How important are ecosystem considerations and next-generation assessments for improving the science used in management of managed fishery species in the southeastern United States?

Questions that could be considered

- What are the short and long term expectations of SEFSC clients (councils, marine fishery commissions, stakeholders) with respect to ecosystem management goals and objectives?
- How can the SEFSC evolve to ecosystem based approaches to fisheries management with very limited growth in base funding?
- What **efficiencies** can the Integrated Ecosystem Approach offer for assessment and management of single species?